

Cisco Nexus Dashboard Fabric Controller 12

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Product overview

Cisco is excited to introduce the next generation of Cisco Data Center Network Manager (DCNM): Cisco Nexus[®] Dashboard Fabric Controller (NDFC). Cisco NDFC is the comprehensive management and automation solution for all Cisco Nexus and Cisco Multilayer Distributed Switching (MDS) platforms powered by Cisco NX-OS. NDFC provides management, automation, control, monitoring, and integration for deployments spanning LAN, SAN, and IP Fabric for Media (IPFM) fabrics. NDFC facilitates seamless interconnectivity, automation, and management for hybrid-cloud environments.

- **Management:** NDFC provides fabric-oriented configuration and operations management. It is optimized for large deployments with little overhead, but traditional deployments are supported and can be customized by the user to meet business needs. NDFC also provides representational state transfer (RESTful) APIs to allow easy integration from Cisco[®] or third-party overlay managers, enabling the automation to meet customers' needs.
- **Automation:** NDFC brings an easy-to-understand and simple deployment approach to bootstrapping new fabrics in private and hybrid-cloud deployments. Cisco's best practices are built into the fabric builder policy templates, and automatic bootstrap occurs with the click of a button, reducing provisioning times and simplifying deployments.
- **Monitoring and visualization:** NDFC maintains the active topology monitoring views per fabric into the new NDFC UI. When combined with Cisco's Nexus Dashboard Insights (NDI), customers can complement their solution with advanced support for day-2 operations.

Cisco Nexus Dashboard Fabric Controller Release 12 features

Cisco NDFC is fully integrated as a native service on the Cisco Nexus Dashboard (ND), providing a single sign-on and a simplified user experience across the entire data center software portfolio. Scale and performance were top of mind in the development of NDFC and as such included modern architectures that include microservices and containerization of functions to help ensure reliability and allow for growth over time.

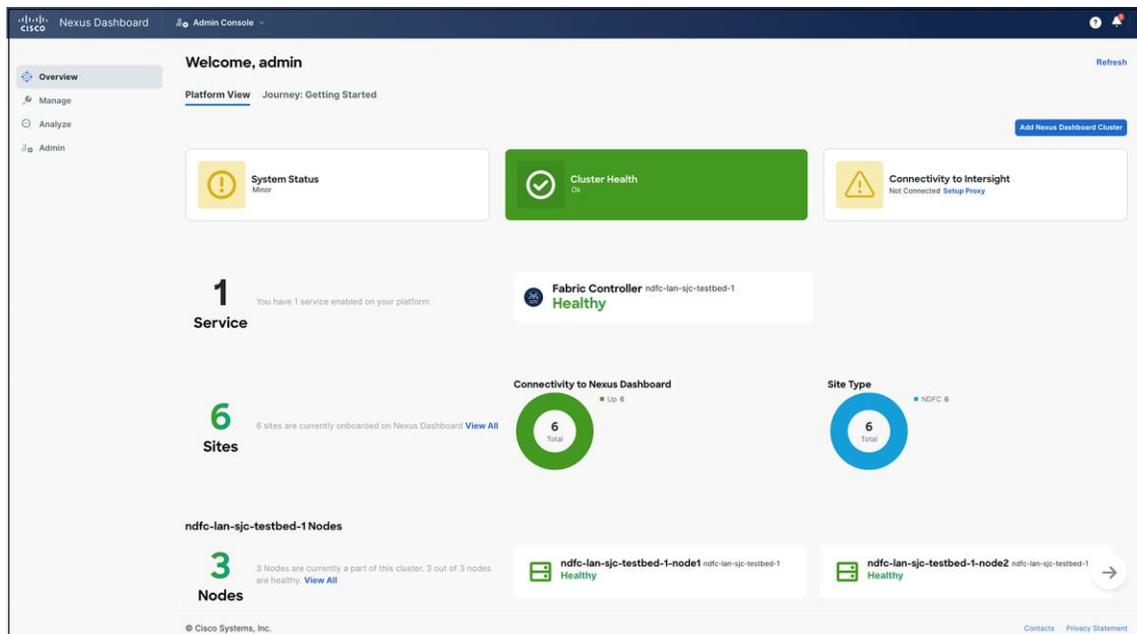


Figure 1.
Nexus Dashboard Platform View

Enriched UI

The architecture in NDFC is based on microservices, running on Nexus Dashboard. By moving away from a monolithic to a containerized and modular infrastructure, users will be able to leverage this new model to enable elastic scale out. NDFC will also support active/active high availability with L2 reachability or L3 reachability for 3-node clusters. NDFC offers a great look and feel with an intuitive React JS GUI that will align to the GUI in Nexus Dashboard, and other services and support modernized topology views. The dashboard overview (Figure 2) provides a summary of the major details of all of the fabrics managed by that instance.

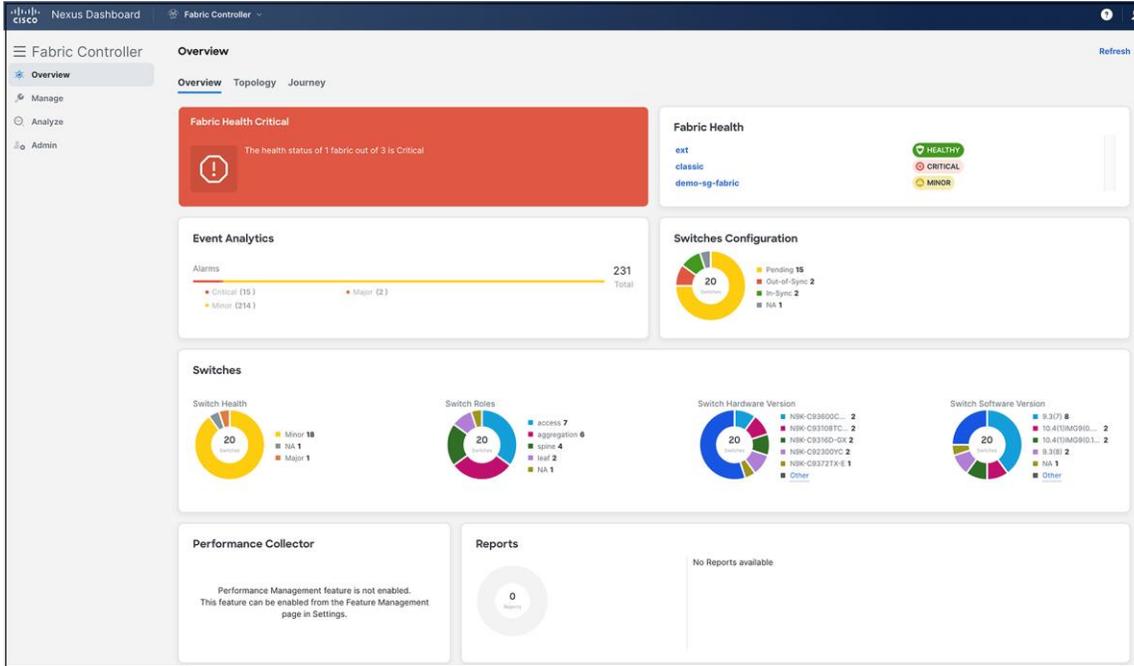


Figure 2.
Cisco Nexus Dashboard Fabric Controller UI: overview

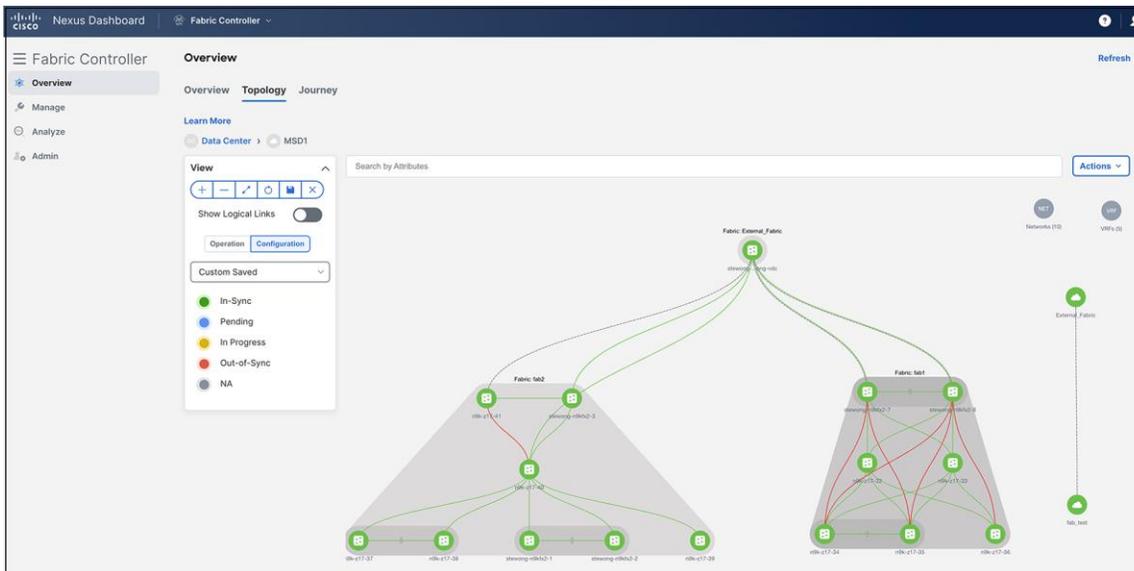


Figure 3.
Cisco Nexus Dashboard Fabric Controller UI: topology

Journey

NDFC offers you guided workflows on the various milestones in your NDFC journey. These guided workflows give you details on the items required in each milestone, starting with setting up the controller service and including creating fabrics, adding switches, etc.

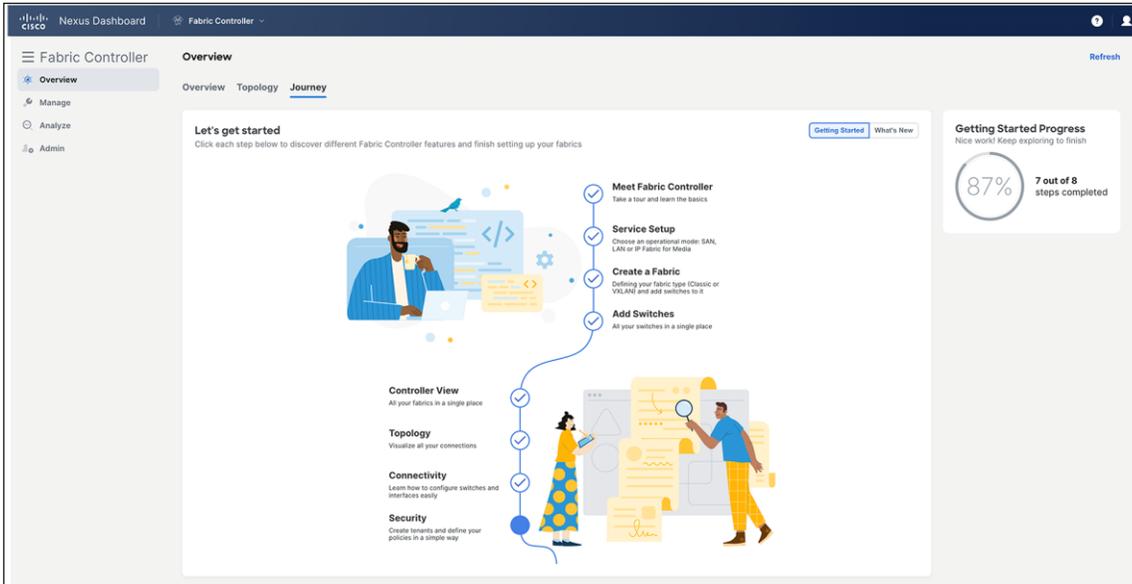


Figure 4.
Cisco Nexus Dashboard Fabric Controller UI: journey

Feature manager

NDFC has a runtime feature installer, which helps you to select a mode at installation for LAN, SAN, or IPFM. This feature-management capability will allow you to selectively enable or disable different features, including Fabric Controller (LAN), SAN, IPFM, and Fabric Discovery.

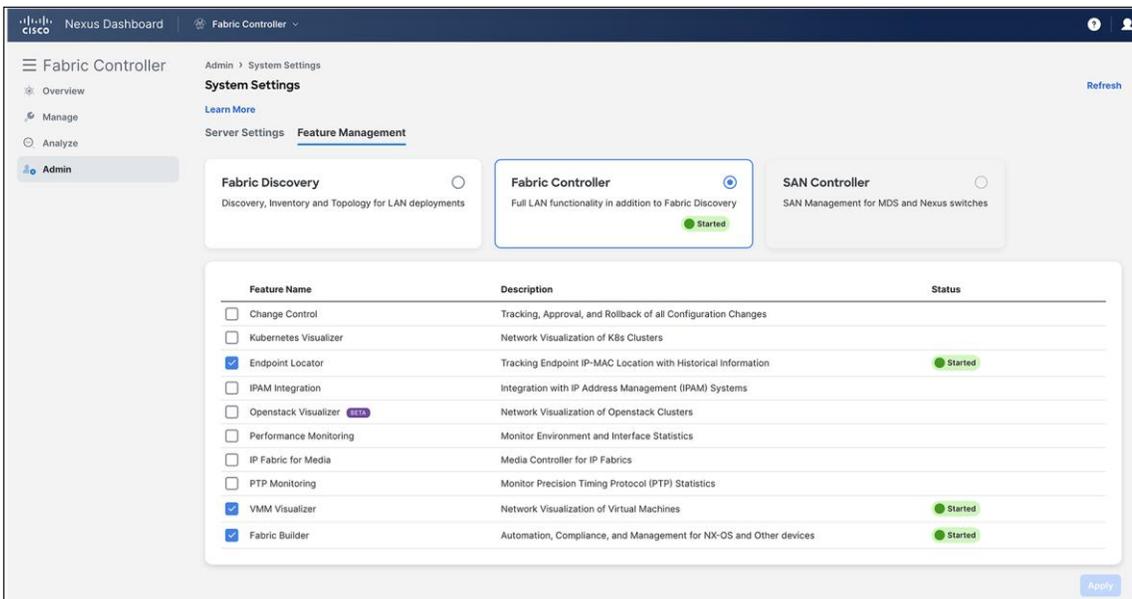


Figure 5.
NDFC feature manager UI

LAN Fabric One View

NDFC provides a one-view dashboard, aggregating information from multiple federated NDFC-managed LAN fabric clusters. It provides remote users with a comprehensive overview of the network, including the number of LAN clusters, fabrics, and switches, along with detailed displays of health statuses, release versions, and switch models. Users can access the dashboard by logging in remotely to Nexus Dashboard, allowing for efficient monitoring and management of multicloud networks from a single screen. Users can also launch detailed views of any fabrics residing in any NDFC cluster from this screen.

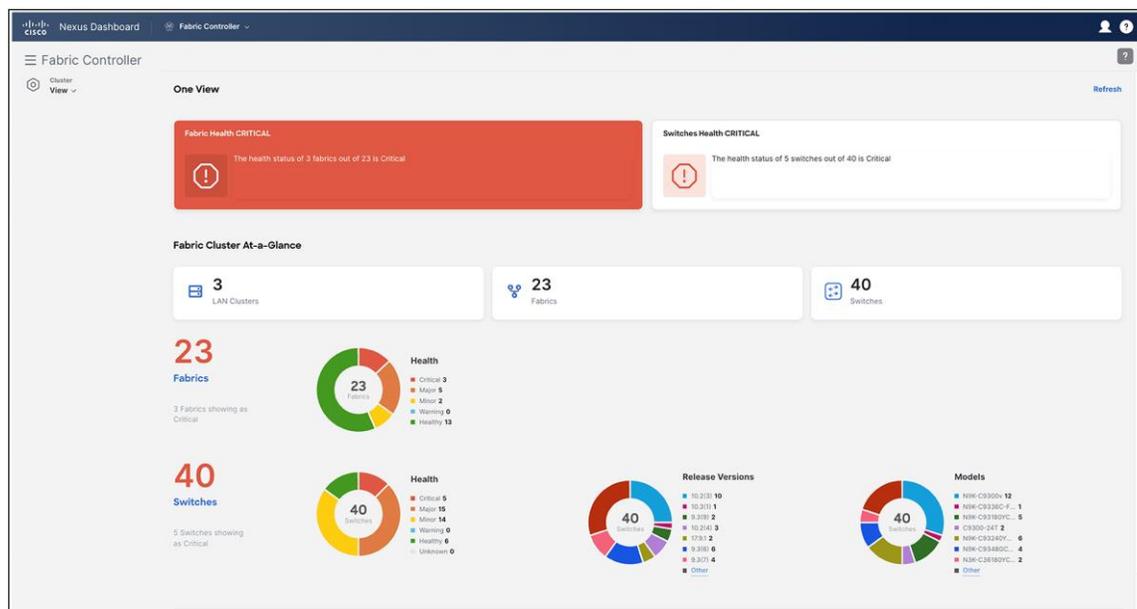


Figure 6.
NDFC LAN Controller One View

Nexus Dashboard Fabric Discovery

NDFC includes a base capability selection for Fabric Discovery. Fabric Discovery will be a lightweight version of NDFC and, when enabled, will support the inventory discovery, and monitoring only. Configuration and provisioning will not be supported when this option is selected. This option will let users who are using NDFC for monitoring or Day-2 Ops minimize resource utilization and further customize NDFC for their specific needs.

Change control management

The new change control management feature (starting with NDFC Release 12.1(3)) enables tracking and approval of network intent changes. It associates unique tickets with specific actions, allowing deployment operations to occur only through these change control tickets, ensuring a controlled and auditable process. This feature streamlines network configuration changes by enforcing a structured approval workflow, enhancing operational control and compliance.

Hybrid-cloud connectivity and automation

NDFC will support hybrid-cloud connectivity and automation for customers who expand beyond their private cloud deployments. NDFC expands its power of data center interconnectivity solutions and integrates with Cisco Nexus Dashboard Orchestrator and Cisco Cloud Network Controller to provide seamless and secure hybrid -cloud interconnectivity for multitenant workloads. NDFC will support interconnectivity with AWS and Microsoft Azure public clouds.

Fabric software management

Large networks need to be maintained efficiently. NDFC will have fully redesigned image management, making upgrades easy and less time-consuming. This new, easy, and customizable workflow will be for device upgrades and downgrades, patching, Electronic Programmable Logic Device Upgrades (EPLDs), Software Maintenance Updates (SMUs), and more. NDFC can recommend or create groups for switch upgrades, allowing users to track the upgrade of switches in a fabric in a more controlled way than previously. Users can either use the groups suggested by NDFC, or they can create their own groups, based on user roles, switch roles, type of switches, etc. NDFC will continue to support maintenance-mode and RMA actions right on the actual topology display - you can put a switch into maintenance mode and swap serial numbers with a replacement unit with a few clicks.

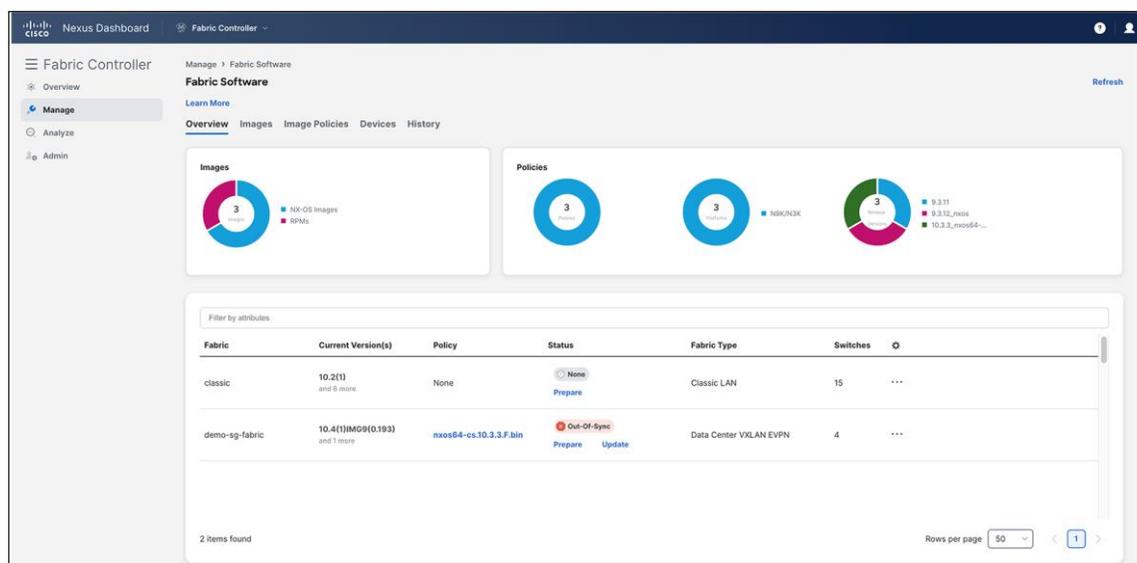


Figure 7.
NDFC fabric software management

Git repository integration

The addition of this feature allows users to seamlessly integrate their Git repository with NDFC, enabling synchronization for nondefault templates. This feature facilitates external nondefault template modifications, ensuring a streamlined process as changes are pulled into NDFC and deployed across fabrics. You can also push any template updates back to the Git repository, as needed. Network administrators benefit from this enhanced flexibility, particularly in managing scaled environments with multiple NDFC instances, allowing them to leverage uniform templates across their network infrastructure effortlessly.

Compute visibility on fabric topology view

NDFC integrates VMware topology onto its dynamic topology views. You simply “Discover” a vCenter that controls the host-based networking on the fabric to show how the virtual machine, host, and virtual switches are interconnected. This is a great benefit for the network operator because it provides compute visibility, which is ordinarily the purview of compute administration.

Cisco Smart Licensing Policy

Implementation of Cisco Smart Licensing Policy (SLP) with NDFC will further enhance the current smart licensing capabilities. SLP aims to increase ease of use by enforcing fewer restrictions with a goal of reducing the overall license friction.

Non-Nexus Platform Support: IOS-XE and IOS-XR

For Cisco IOS® XE platform Cisco Catalyst® 9000 Series Switches, NDFC will now support VXLAN EVPN automation. Using this new fabric-builder template with built-in best practices, you can extend your VXLAN EVPN overlay networks for greenfield deployments of Catalyst 9000 switches.

NDFC will also provide additional support for Cisco IOS XR devices, Cisco ASR 9000 Series, and Cisco Network Convergence (NCS) 5500 Series, to be managed in external fabric in managed mode. NDFC will be able to generate and push configurations to these switches, and configuration compliance will also be enabled for these platforms.

Granular Role-Based Access Control (RBAC) model for existing roles

With NDFC, RBAC will be orchestrated directly in the Nexus Dashboard. NDFC offers granular RBAC roles, allowing users to have varying levels of access across different fabrics within the NDFC instance. For example, one user could be a network administrator for one fabric while being a network stager for another. The latest NDFC release supports new user roles such as change approver and change deployer in addition to the existing roles, to facilitate change control management.

Programmable reports for performance monitoring

NDFC previously introduced programmable reports, which provided detailed information on devices. A new template will be added to support NDFC to generate these programmable reports for performance monitoring. These reports can be used for LAN, IPFM, and SAN deployments. You will also be able to email these generated reports to users.

Multitenancy VRF

With this feature, we are bringing in VRF support for Non-Blocking Multicast (NBM) deployments where we can logically isolate multiple customers so that they can co-exist on the same fabric. Multiple VRFs can be enabled in either an IPFM NBM active or NBM passive mode.

Fabric builder for IPFM

To ease your IPFM network provisioning, NDFC will now start supporting availability of preconfigured policy templates that were created keeping best practices in mind – to build your IPFM underlay in minutes.

NDFC SAN Insights brings SAN Analytics to life

One of NDFC's most important features is SAN Insights, which provide collection and visualization of the MDS SAN Analytics capabilities. This feature provides insight into end-to-end flow-based metrics, custom graphing, outlier detection, ECT analysis, summary dashboards, and the newest feature: anomaly detection. Anomaly detection provides a fully customizable infrastructure that can be used to identify and alert on issues captured by the SAN Insights capabilities. SAN Insights also include new infrastructure to help consume all the new streaming telemetry data available on the new 64Gbps and 32Gbps MDS switches from Cisco.

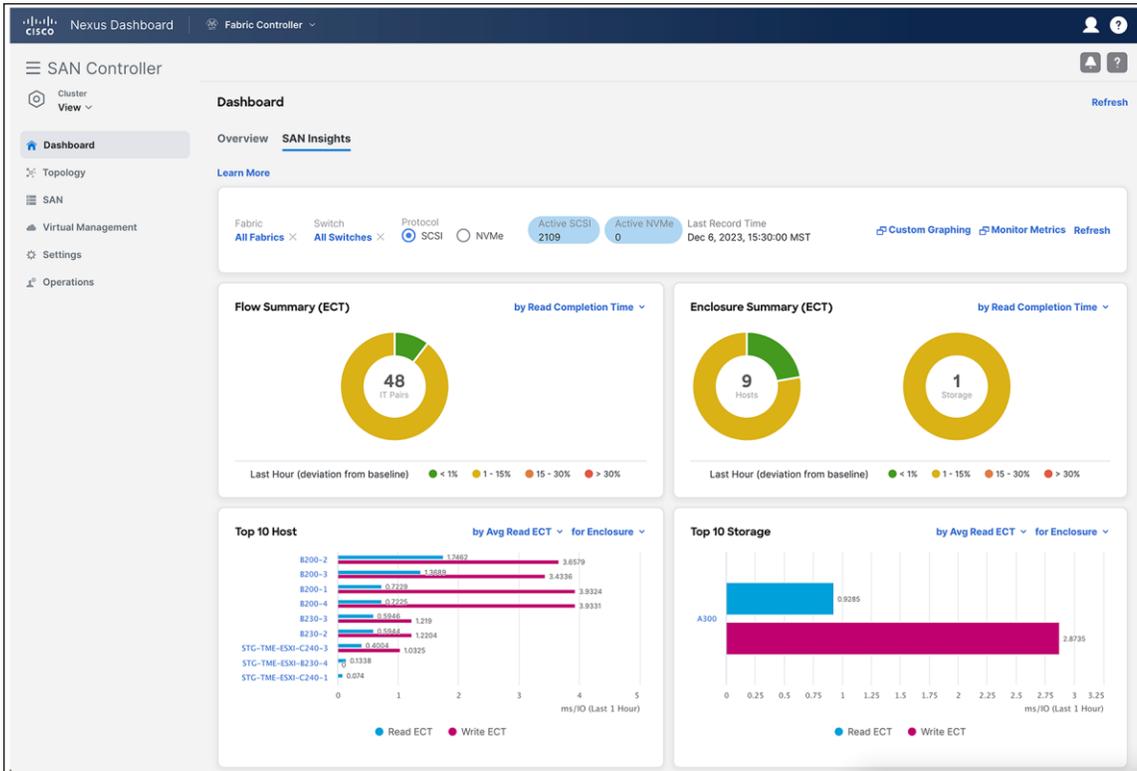


Figure 8.
NDFC SAN insights dashboard

NDFC SAN Controller OneView

NDFC SAN Controller OneView is a new feature that provides a single pane of glass to get a holistic view of the larger enterprise from within NDFC. This view will provide high-level summary information about all the managed fabrics from within NDFC. This manager-of-managers view is critical for successful management of multisite deployments and comes at no additional cost. The functionality also provides native click-through capabilities so that the end user can explore that site in more detail to further enhance management and troubleshooting operations.

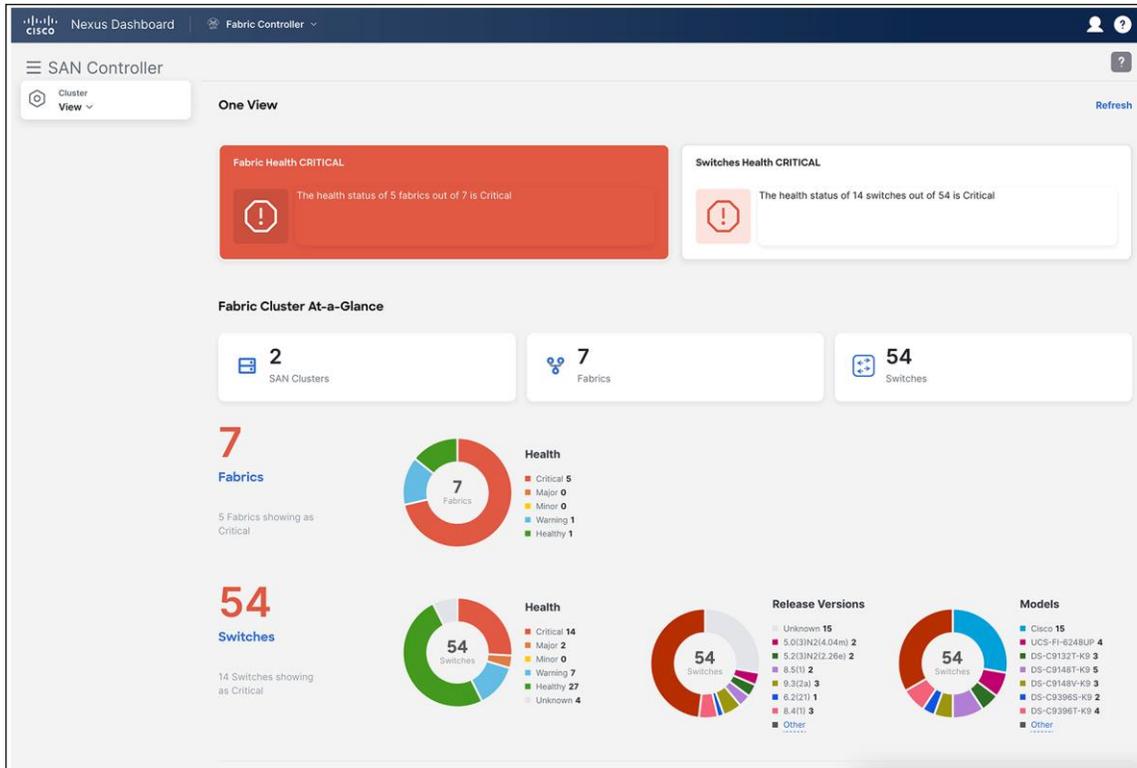


Figure 9.
NDFC SAN Controller OneView

Host and storage views

NDFC introduces a new interface that allows customers to see host and storage devices connected to the fabrics they manage. In these new views the user is provided end-device-specific information that can be used to understand pathing health, optics trends, SAN analytics metrics, events, diagnostics data, errors, driver and HBA firmware versions, and much more. This data is provided within the context of the host or storage device the administrator chooses to explore. This view also allows the administrators to view in depth virtual machine information and can now track virtual machine analytics metrics, CPU/Mem utilization, and disk I/O data as well. This is a powerful feature that will make managing connected devices even easier; it provides a wealth of information to help understand overall host and storage health, with a single interface into all of the relevant information.

The screenshot displays the Cisco Nexus Dashboard SAN Controller interface. The top navigation bar includes 'Nexus Dashboard' and 'Fabric Controller'. The main menu on the left shows 'SAN Controller' with options for Overview, Manage (selected), Analyze, and Admin. The 'Inventory' section is active, with sub-tabs for Switches, Interfaces, Links, End Devices, Storage Devices (selected), Hosts, and FICON. A 'Refresh' button is located in the top right. Below the navigation, there are filter options: 'Show All Storages' (selected) and 'Show Only Storage Devices with Down paths'. A search bar labeled 'Filter by attributes' and a 'Show last day' button are also present. The main content is a table of storage devices with the following columns: Enclosure Name, Up/Total Paths, Type, Peak Tx(%), Peak Rx(%), CRC, Corrected FEC, Uncorrect... FEC, ITW, Last Update Time, IP Address, and Protocol. The table lists 11 items, including various IBM and StorageTek enclosures. At the bottom, it indicates '11 items found' and 'Rows per page 10'.

Enclosure Name	Up/Total Paths	Type	Peak Tx(%)	Peak Rx(%)	CRC	Corrected FEC	Uncorrect... FEC	ITW	Last Update Time	IP Address	Protocol
HDS_57311	11/12	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		
IBM305ff66fc	7/8	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		
IBM307ffc631	2/2	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		
IBM400c7afb8	98/98	Fabric	53	67	0	0	0	0	2023/12/06-21:57:42		
IBM400c953b8	95/95	Fabric	51	65	0	0	0	0	2023/12/06-21:57:42		
SYM_6094	8/8	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		
IBM307ffc31	7/7	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		
IBM40580752f	2/2	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		
StorageTek0007c458	0/1	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		
StorageTek50000901	3/3	Fabric	0	0	0	0	0	0	2023/12/06-21:57:42		

Figure 10.
NDFC SAN Controller host and storage views

Dynamic Ingress Rate Limiting

NDFC also plays an important part in integrating some of the most modern software features Cisco has created to help eliminate congestion in SAN fabrics. NDFC provides an interface to fully configure Dynamic Ingress Rate Limiting (DIRL) so that any congestion in the fabric can be eliminated automatically and with almost no impact. DIRL can help with both credit starvation and over-utilization situations that can have big implications on the SAN fabric by controlling the rate of frames from the anomaly in the fabric while at the same time reducing the impact to operations. NDFC plays an important role in helping to simplify the deployment of DIRL so that it can be implemented quickly to easily to solve slow-drain conditions.

Optics information for SAN interfaces

NDFC introduces a new interface that allows customers to see trends in optics temperature and power over time. This new feature provides insight into how optics are working overtime and can help reduce individual outages that are often due to optics failures.

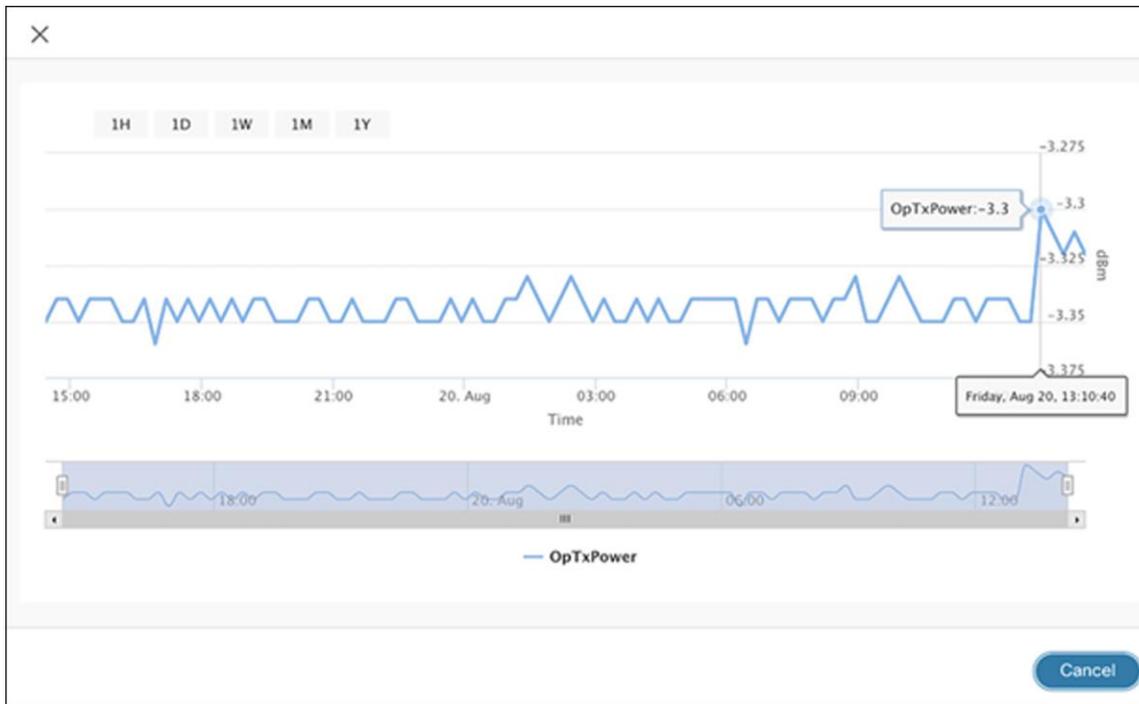


Figure 11.
NDFC SAN Controller - optics insights

Zoning interface

NDFC has reinvented the way customers will do SAN zoning in the future. This includes a new interface in the web-user interface that focuses on managing regular and IVR zones. This is a feature many customers use every day, and Cisco has worked to improve the look, feel, and navigation of the zoning interface to make the data easier to use and faster to deploy correctly.

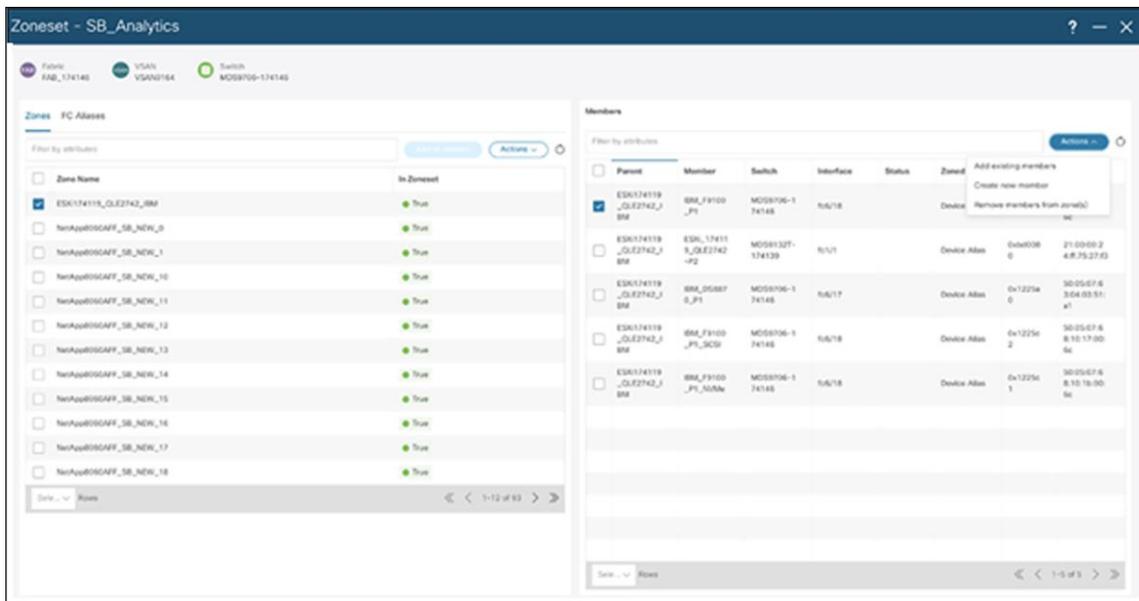


Figure 12.
Zoning interface

NDFC feature details and benefits

Table 1. NDFC features and benefits

Feature	Benefits
Infrastructure and GUI	<ul style="list-style-type: none"> • Modular, microservices-based architecture to enable scale-out models • React JS-based UI to simplify and enhance GUI interactions • Supports active/active high availability for either LAN or SAN deployments • One view dashboard for LAN fabrics across multiple NDFC clusters • Includes runtime feature manager for LAN, SAN, and IPFM deployments • Journey map to guide users across different NDFC milestones. • Nexus Dashboard Fabric Discovery mode for inventory, discovery, and monitoring only • User feedback tool integration to allow users to submit feedback/requests to be reviewed by product team
Dashboards	<ul style="list-style-type: none"> • Provides last-24-hours summary of events and top “talkers” • Offers custom summary view of LAN and SAN domains and topology groups • Provides host, switch, and fabric dashboards and provides views of configurations, control, events, and traffic and context-based searches from dashboards • Brings the NDFC computing dashboard into the VMware vCenter for dependency mapping and inventory, performance, configuration, and event views
Customizable templates	<ul style="list-style-type: none"> • Includes best-practice policy templates with Python support and built-in compliance checking for fabric builder • Provides prebuilt templates for classic LAN mode provisioning • Allows creation of new customizable templates using template editor • Allows import and conversion of configuration scripts to templates
REST and JavaScript Object Notation (JSON) API	<ul style="list-style-type: none"> • All northbound APIs are REST. NDFC’s GUI uses these REST APIs for all GUI functions. • Includes self-documented “swagger”-style built-in documentation, with examples • Enables integration with third-party or custom orchestration and automation tools like Ansible
Automation for classic Layer2/Layer3 networks	<ul style="list-style-type: none"> • New enhanced classic LAN fabric, to provide fully automated workflows for any classic Layer2/Layer3 deployments • Includes intuitive fabric management with built-in best practices and maximum visibility • Supports configuration compliance
Configuration and change management for classic LAN Mode	<ul style="list-style-type: none"> • Provides predeployment validation of configuration changes to help reduce human errors (POAP includes this feature as well.) • Provides a general configuration archive to track changes, allowing rollback to a last-known good state • Provides capability to back up configuration files from all switches for classic LAN-mode operations • Brownfield host port interface configuration sync-up capability supports resync of out-of-band host port configurations to NDFC
Fabric software	<ul style="list-style-type: none"> • Includes support for Cisco In-Service Switch Upgrade (ISSU), Graceful Insertion and Removal (GIR) and Return Material Authorization (RMA) functions • Includes installation/uninstallation of SMUs and RPMs for Cisco Nexus platforms • Supports NX-OS image and EPLD Installation and upgrades from the GUI

Feature	Benefits
LAN fabric with VXLAN EVPN	
Fabric control and overlay visibility and management	<ul style="list-style-type: none"> • Provides fabric management for multiple types of LAN solutions, including VXLAN-EVPN, and traditional 3-tier LAN deployments with workflows for provisioning LAN services such as VPCs • Includes intuitive overlay management with built-in best practices and maximum visibility for robust Cisco NX-OS configuration profiles • Autodetects unprovisioned switches for use in fabric builder with day-0 POAP for policy-based bootstrapping of fabric infrastructure • Compliance management ensures that network is in sync with intended deployment and notifies users when out of compliance, allowing users to deploy any corrections • Supports easy provisioning using interface groups. Attaches overlay networks to groups in one go, allowing new interfaces added to the group to automatically inherit the configuration. • Integration with Nexus Dashboard Orchestrator (NDO) to extend overlay networks or VRFs between VXLAN-EVPN fabrics managed by different NDFC instances • Support for overlay network and VRF provisioning using CLI
Hybrid-cloud connectivity	<ul style="list-style-type: none"> • Supports hybrid-cloud connectivity with AWS and Microsoft Azure public clouds • Integrates with Cisco Nexus Dashboard Orchestrator (NDO) and Cisco Cloud Network Controller to provide L3 VRF stretch between private and public clouds
Unified topology views and control	<ul style="list-style-type: none"> • Presents topology views showing physical and overlay networks on the same page, helping IT administrators quickly identify the extent of virtual overlay networks on a programmable fabric • In topology view, shows VXLAN details, VXLAN Tunnel Endpoint (VTEP) status, and VXLAN Network Identifier (VNI) status on a per-switch basis • Presents smart topology views showing virtual port channels (vPCs) and virtual device contexts for Cisco Nexus networks (Topology views include VXLAN search.)
Role-Based Access Control (RBAC) for fabric objects	<ul style="list-style-type: none"> • Allows Role-Based Access Control (RBAC) within the fabric to separate administrative tasks between functional domains • Granularized RBAC model supports the same user having different roles across different fabrics
IP Fabric for Media (IPFM)	
Flow control	<ul style="list-style-type: none"> • Flow and host policy manager
Visualization and health	<ul style="list-style-type: none"> • Topology and endpoint visibility. • End-to-end flow visualization. • Network health monitoring. • RTP and EDI flow monitoring
Provisioning and automation	<ul style="list-style-type: none"> • Fabric bootstrap: day-0 provisioning. • API gateway for broadcast controller. • Fabric builder for IPFM underlay network with nonblocking multicast
Storage Networking (SAN)	
SAN Analytics integration with Cisco SAN Insights	<ul style="list-style-type: none"> • Provides SAN Analytics visualization at scale, providing a single pane of glass into hundreds of thousands of FC flows • SAN Insights anomaly detection can find real-world issues and send alerts in real time • Fully customizable infrastructure to create and manage SAN Insights events • Always on and auto-learned approach for all FC flows

Feature	Benefits
Storage topology and visibility	<ul style="list-style-type: none"> • Switch, end device, VSAN, and zoning visualization on the topology maps • Allows you to see trends and explore link bandwidth straight from the topology map • Health color coding to quickly find and troubleshoot issues • Device manager integration for all switches in the topology • Storage and host visualization on the topology map
SAN zoning	<ul style="list-style-type: none"> • Totally redesigned web-based zoning interface to drastically reduce the cycle time for common administration tasks. Provides IVR zoning function as well, on the same page. • Provides a web-based FC and device-alias configuration to ease transition to a web-based user interface for zoning and other management tasks
Automated analysis	<ul style="list-style-type: none"> • SAN host-path-redundancy feature to better organize and identify virtual and physical hosts with path-redundancy problems in the fabric • Slow-drain analysis features to increase efficiency and reduce the time to discovery for slow-drain devices
Storage management	<ul style="list-style-type: none"> • Provides visibility into all modern storage products to help provide information to storage administrators in the context of SAN management • Port channel and VSAN management updated • FICON management
Visibility, monitoring, and troubleshooting (common features)	
Automated discovery	<ul style="list-style-type: none"> • Using automated network discovery provides up-to-date physical and logical inventory information. • Tracks inventory and performance information in real time
Topology overlays and views	<ul style="list-style-type: none"> • Provides detailed visibility into real-time and historical performance statistics in the data center. • In topology views, link-layer and overlay status details alongside switch details to aid troubleshooting and visibility. • Provides general visibility into Layer-2 network connectivity mapped on the physical topology view • Provides topology, configuration, and information for virtual machines, port groups, DVS/vSwitches, vNICs, and VMNICs correlated with the physical network topology • Provides insight into port and bandwidth use, error count, traffic statistics, etc.
Event management, reports, and alarms	<ul style="list-style-type: none"> • Provides real-time network-health summary with detailed views of individual network components, enabling operations staff to respond quickly to events based on event severity • Alarm function provides stateful alarm monitoring to show if an error condition is active. Users can define an alarm policy for the device, interface, or syslog conditions and can email alarms to users. • Provides easy-to-schedule reports using predefined templates, including inventory, use, health, and performance monitoring reports. These reports can be exported for postprocessing or sent by email. • Allows creation of custom port groups based on priority and severity level of the application and implementation of rule-based event-forwarding to notify the system or user of traps and syslog messages generated for the custom port group

Platform support information

Table 2. Platform support information

Product family	Platforms supported
Cisco Nexus switches	Cisco NDFC supports most current Nexus switch family product offerings. See the Compatibility Matrix and Release Notes for NDFC Release details.
Cisco MDS storage switches	Cisco NDFC supports most current MDS switch family product offerings. See the Compatibility Matrix and Release Notes for NDFC Release details.

Server requirements

Cisco NDFC Release 12 runs on the Nexus Dashboard platform. It is supported on:

- Virtual Nexus Dashboard for LAN, IPFM, and SAN deployments
- Physical Nexus Dashboard for LAN, IPFM, and SAN deployments

The table below lists the server resource requirements for deploying the Nexus Dashboard Fabric Controller Release 12 on Nexus Dashboard.

Table 3. Server requirements

Mode	Virtual ND	Physical ND
LAN	16vCPUs and 64G RAM, 500G SSD	40vCPUs and 256G RAM, 4* 2.2 TB HDD, 370G SSD, 1.5 TB NVMe
IPFM	16vCPUs and 64G RAM, 500G SSD	40vCPUs and 256G RAM, 4* 2.2 TB HDD, 370G SSD, 1.5 TB NVMe
SAN	Small Node: 16vCPUs and 64G RAM, 500G SSD (No SAN Insights) Large Node: 32vCPUs and 128G RAM, 3TB (with SAN Insights)	40vCPUs and 256G RAM, 4* 2.2 TB HDD, 370G SSD, 1.5 TB NVMe

Ordering information

To order Cisco Nexus Dashboard Fabric Controller Release 12 licenses, contact your Cisco sales representative. Or access Cisco Commerce at [Cisco.com](https://cisco.com).

Cisco Capital

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